AMENDMENT
U.S. Appln. No. 09/582,756

REMARKS

Claims 1-26 are all the claims pending in the application.

In regard to the IDS filed on September 26, 2001, Applicants provided partial translations

for the most relevant portions of the references submitted. Applicants did not provide

translations for the portions to which the Examiner specifically referred in the Office Action

dated July 13, 2001, since it is presumed that the Examiner has translations of the documents.

I.   Response to Claim Rejections Under 35 USC § 102

Claims 1-26 were rejected under 35 USC § 102 (a), (b), or (e) as anticipated by the

following references:

1.   JP 8-57950;

2.   JP 6-82624;

3.   JP 7-287118; or

4.   JP 4-116603.

The Examiner asserts that the references disclose a process for producing a polymer

prepared from the same components as claimed by Applicants. The Examiner also points out

that Applicants' claim 1 contains open language and does not exclude additional moieties

disclosed in the reference.

The Examiner takes the position that any properties or characteristics inherent in the prior

art, although unobserved or detected by the reference, would still anticipate the claimed

invention. In view thereof, the Examiner asserts that there appears to be no significant difference

between the reference(s) and that any differences not specifically mentioned appear to be

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conventional. Thus the Examiner concludes that the claimed invention cannot be deemed as novel and accordingly is unpatentable.

Applicants traverse the rejection and respectfully submit that none of the references cited by the Examiner teach the presently claimed invention. The presently claimed invention is directed to a retardation film that is a single oriented polymer film (not a laminate film of two or more films) having specific properties of a shorter retardation at a shorter wavelength ("reverse retardation distribution") and a water absorption of no greater than 1%. There has been no single retardation film which has a shorter retardation at a shorter wavelength ("reverse retardation distribution") and it was thought in the art that it is not possible to make a single film having a reverse retardation distribution. In support thereof, we enclose copies of 1)Yoshimi Hiroyuki "Characterization of Retardation Film Using Optical Analyzer "KOBRA" (Nitto Technical Report Vo. 37, No. 2, pp 35-36, Nov., 1999) and 2) a book "Catch Ball between Polymer Science and Physics - Polymers supporting Electronics Multimedia" edited by The Society of Polymer Science, Japan, published Nov. 30, 2000 (pp. 146-147 written by Okada Toyokazu of Sumitomo Chemical Company). Both the authors of the above articles are skilled in the art of retardation films and work at the largest manufacturers of retardation films. In these references, it is mentioned that it is not possible to make a single film having the reverse retardation distribution.

The present inventors are the first to provide a single film having the reverse retardation distribution which is significant. The mechanism by which a single film having the reverse retardation distribution is attained in the present invention is described in the specification, which

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was discovered by the present inventors.

Although the novel retardation film of the present invention is made of a polymer(s) which may include the same monomer units which are known by themselves, the composition of the monomer units in the polymer(s) of the retardation film of the present invention is necessarily different from that known in the prior art. As mentioned above, those skilled in the art noted that it is not possible to make a single retardation film which has a shorter retardation at a shorter wavelength, which clearly establishes that the compositions of the known retardation films were different from the composition of the present. Further we will specifically describe or prove that the compositions described in the cited references do not provide a single film having the reverse retardation distribution in the following.

Cellulose acetate film is the one exception of a film that was known to exhibit the reverse retardation distribution (JP-A-04116603). However, this film has a water absorption factor as high as about 4% to 10% preventing it from being practically used as a retardation film in displays. The authors of the above articles, Yoshimi and Okada were aware of cellulose acetate film but it did not change their consideration that it is not possible to make a single film having the reverse retardation distribution. Further references describing a cellulose acetate film do not teach or suggest the mechanism of the single retardation film having the reverse retardation distribution of the present invention.

No single film having the reverse retardation distribution as presently claimed has been manufactured and sold in the world. The present invention has first provided a practical single retardation film having the reverse retardation distribution for displays. The present invention

excludes a film having a water absorption factor of 1% or more. Accordingly, the single retardation film of the present invention is distinguishable over cellulose acetate films as disclosed in JP 4-116603.

II. Responses to Claim Rejections Under 35 USC § 103

Claims 1-26 were rejected under 35 USC § 103(a) as unpatentable over the references cited above for the same reasons cited above. Additionally, the Examiner states that it would have been obvious to one having ordinary skill in the art at the time of the invention was made to employ particular amounts and/or parameters as claimed, since it is well established that merely selecting proportions and ranges is not patentable absent a showing of criticality.

Applicants respectfully traverse the rejection for the reasons above, namely that the cited references do not teach or suggest the presently claimed single film having the claimed reverse retardation distribution and having a water absorption of no greater than 1%.

A. References Cited By the Examiner

1. JP-A-08-57950

JP '950 discloses a biaxially expanded film for protection of a polarizer and therefore aims to provide an optically isotropic, i.e., small retardation film (see [0001] to [0004], [0010] etc. of JP '950), which teaches away from a retardation film of the present invention in which a retardation of more than a certain level is required. JP '950 discloses polymer blends comprising polystyrene (PS) and polyphenyleneoxide (PPO) in Examples 1, 3 and 5. All the blends in Examples 1, 3 and 5 have a positive retardation, and therefore they are different from the film of the present invention. Thus, JP '950 does not teach or suggest the present invention.

2. JP-A-06-82624

JP '624 discloses a polycarbonate film as a retardation supplementing film and does not disclose or teach the reverse retardation distribution or even the retardation distribution at all. Thus, the teaching of JP '624 is within the prior art, that is, polycarbonate films with a smaller retardation at a longer wavelength. The prior art taught as mentioned above and as shown in the above literatures that it is not possible to make a single retardation film having a shorter retardation at a shorter wavelength.

JP '624 describes polycarbonates having fluorene structure (page 5), bisphenol monomers (pages 5 arid 6), and a specific retardation supplementing film of a polycarbonate comprising 0.05-1 mole of fluorene and 0.205 mole of other bisphenol components in Example 3.

However, these descriptions do not teach the present invention. Not all polycarbonates comprising fluorene structure exhibit the reverse retardation distribution as expressed by the formula (1) and/or (2) of claim 1 of the present application. More specifically, when a polycarbonate comprising fluorene structure is used, the requirements (1) to (3) of claim 4 of the present application must be satisfied in order to satisfy the formula (1) and/or (2) of claim 1 or the reverse retardation distribution. JP '624 does never teach or suggest the reverse retardation distribution or the requirements (1) to (3) of claim 4 of the present application. That is, JP '624 does not teach or suggest the idea of the present invention at all.

Further, even if the only one polycarbonate specifically described in JP '624 is that described in Example 3, this polycarbonate does not exhibit the reverse retardation distribution.

The reason therefore is as below:

The polycarbonate of Example 3 of JP '624 is represented by the following formula (4) comprising the repeating units (2) and (3):
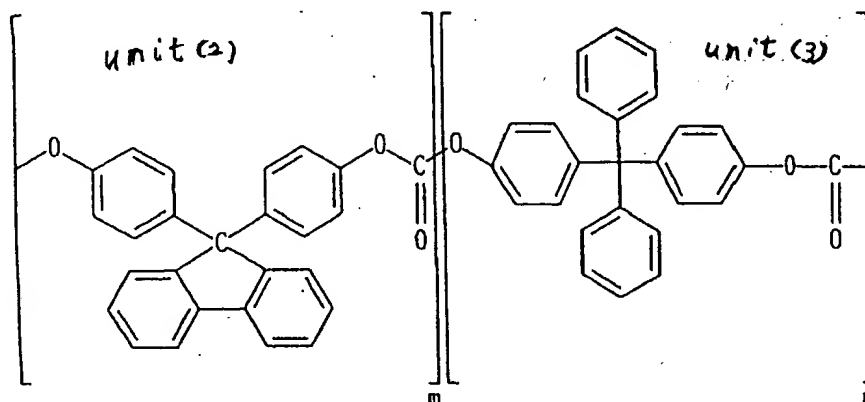
where m : n is 0.2:0.8.

JP '624 mentions that the retardation of the film of Example 3 is 420nm and that of the film comprised of bisphenol A (BPA) of Comparative Example 1 is 290nm (Table 2). Since the film of Comparative Example 1 is considered to have been produced by the same process as that of Example 1 and since the retardations of Example 3 and Comparative Example 1 are considered to be at the same level considering the dispersion or tolerance of the retardation value of 247nm, the birefrigences Δn of the two films can be considered to be at the same level.

The birefrigence $\Delta n(4)$ of the copolymer represented by the formula (4) is the total of the birefrigence $\Delta n(2)$ of the repeating unit represented by the formula (2) and the birefrigence $\Delta n(3)$ of the repeating unit represented by the formula (3). Here $\Delta n(2)$ is negative because of the fluorene (see Table 3 of the present specification). Since $\Delta n(4)$ is positive and $\Delta n(2)$ is negative, $\Delta n(3)$ should be positive. As $\Delta n(4)$ is about the same level of the birefringence of the film of

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Comparative Example 1, Δn(3) should be more than the birefringence of the polymer of the film

of Comparative Example 1.

Table 3 of the present specification shows the retardation distribution R(450)/R(550)

and the birefrigence of the films of polycarbonate homopotymers of various monomers. Among

polycarbonates using monomers [A] to [G], the retardation distributions of the films of

polycarbonate homopolymers [F] and [G] having fluorene structure are significantly different

from the others, but the retardation distributions of the films of polycarbonate homopolymers [A]

and [F] having no fluorene structure are almost the same with each other. The birefringences of

the films of polycarbonate homopolymers [F] and [G] having fluorene structure are negative, but

those of the others are positive. From these, it is considered that the retardation distribution of a

film of homopolymer of the repeating unit represented by the formula (3) is almost the same as

that of the homopolymer of monomer [A], i.e., that of the film of Comparative Example 1 of JP

'624 and the birefrigence of the former homopolymer is positive.

That is, a film of homopolymer of the repeating unit represented by the formula (3) has

a birefrigence almost equal to or more than that of and a retardation distribution almost equal to

that of the film of homopolymer of bisphenol A of Comparative Example 1 of JP '624.

Therefore, from the viewpoint of the optical characteristics, a film of a polycarbonate

comprising 80% of bisphenol A is almost the same as a film of a polycarbonate comprising more

than 80% of bisphenol A. In this case, that is, in a film of a polycarbonate comprising bisphenol

A and fluorene component, even if the fluorene component as the formula (2) is included in an

amount of 40%, a film of the polycarbonate does not exhibit the reverse retardation distribution,

as will be shown for reference 3), JP-A-07-299828. Accordingly, the film of the polycarbonate comprising 80% of bisphenol A and only 20% of fluorene component as represented by the formula (4) does not exhibit the reverse retardation distribution. Thus, JP '624 does not teach or suggest the present invention.

3.   JP-A-07-287118

JP '118 discloses only a retardation film exhibiting the normal retardation distribution. This does not suggest the reverse retardation distribution of the present invention at all.

B.   References Submitted By Applicants

The following were submitted with an IDS on September 26, 2001, and were not cited by the Examiner. However, in an effort to facilitate examination and expedite prosecution Applicants distinguish the present application from the cited references.

1.   JP-A-299828

JP '828 discloses a process for producing an optical polycarbonate film using a particular solvent of dioxorane. JP '828 discloses only conventional optical films of polycarbonate and does not teach or suggest the reverse retardation distribution of the present invention at all. As described above, it was considered that it is not possible to make a single film exhibiting the reverse retardation distribution.

JP '828 includes specific descriptions in Examples 19, 20 and 21 where a polycarbonate comprising 9,9-bis (4-hydroxyphenyl) fluorene (FL) and bisphenol A (BFA) is prepared, a cast film is formed it, and the cast film is expanded to form a retardation film. However, these films produced in Examples 19-21 are not a film exhibiting the reverse retardation distribution as

shown below:

The inventor has previously confirmed that a polycarbonate comprising 9,9-bis(4-hydroxyphenyl)fluorene (fluorene component) and bisphenol A do not exhibit the reverse retardation distribution when the content of the fluorene component is smaller than a certain value while the specific lower limit depends on the composition. Therefore, Example 21 of JP '828 was experimentally followed as below since the content of the fluorene component is the largest so that the possibility of exhibiting the reverse retardation distribution is the highest, and it was confirmed from the experiment that the film prepared did not exhibit the reverse retardation distribution. Accordingly, the films prepared in Examples 19 and 20 would not exhibit the reverse retardation distribution, either.

EXPERIMENT

Preparation of starting solution

15 wt% of polycarbonate resin comprising 9,9-bis(4-hydroxyphenyl)fluorene and bisphenol A (molar ratio 40/60; viscosity average molecular weight 5.7×10^4) used in Example 21 of JP '828 was added to 85w1% of 1,3-dioxorane to prepare a clear viscous solution. The solution had a haze of 0.5%. The above polycarbonate resin used in Example 21 of JP '828.

The above polycarbonate resin used was the resin which used for JP '828 and had been stored in the laboratory of the assignee, as the applicant of JP '828 is the assignee of the present application.

Formation of a cast film

From the solution a cast film was formed in the same manner as in Example 21 of JP

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'828. That is, the solution was cast on a stainless steel plate with a doctor blade at room temperature and then dried at 40 C for 10 minutes, 80 C for 20 minutes, 120 C for 30 minutes, 160 C for 30 minutes and 195 C for 1 hour. The remaining solvent content of the film was 0.4wt%.

Expansion of film

The dried cast film was expanded for 25% in a dryer under the conditions as shown in the following Table and three expanded films were obtained.

	Expansion Temperature (C)	Expansion Times	Total light Transmission Rate (%)	Haze (%)	Film Thickness (μm)	R(450)/ R(550)	K(450)/ K(550)
1	220	1.25	90	0.4	79	1.05	1.05
2	210	1.25	90	0.4	81	1.04	1.05
3	200	1.25	90	0.4	82	1.04	1.05

Result

As shown in Table, all the three films had the values of R(450)/R(550) and K(450)/K(550) which are larger than 1. That is, the film prepared in Example 21 of JF'828 does not exhibit the reverse retardation distribution.

Since a film exhibiting the reverse retardation distribution was not obtained even in the case of Example 21 of JP '828, it is clear that films prepared in Examples 19 and 20 of JP '828 would not exhibit the reverse retardation distribution. Thus, JP '828 does not teach or suggest the present invention at all.

2.   JP-A-08-278410

JP '410 discloses an optically anisotropic film used in a liquid display device and

describes that the polymer used for the film preferably has "a small birefringence from the viewpoint of effectively exhibiting the performance of the liquid crystal compound added" and therefore "appearance of the birefringence of the polymer should be suppressed" (paragraph [00201). In order to attain the above, "method of mixing a polymer having a positive inherent birefringence and a polymer having a negative inherent birefringence" (paragraph [0022]) and "mixing polyphenyleneoxide and polystyrene at 20:80 to 30:70" (paragraph [0023]) are described.

Thus, JP '410 occasionally describes a blend of polyphenyleneoxide and polystyrene similar to the blend as claimed in claim 9 of the present invention but in JP '410 the blend is described as an example at making the birefringence small, which is essentially different from the present invention which is directed to a retardation film having a more-than-certain retardation. The aim is opposite between JP '410 and the present invention. JP '410 cannot teach the present invention.

3.   JP-A-08-190094

JP '094 discloses on optically anisotropic film used in a liquid display device and conventional optical films only. JP '410 does not teach or suggest the present invention for the reverse retardation distribution at all.

JP '094 specifically describes a film made of a blend polymer of polyphenyleneoxide and polystyrene in Comparative Example 1 and a film comprising a liquid crystal with a blend polymer similar to that of Comparative Example 1 in Example 1, but these films do not exhibit the reverse retardation distribution.

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Concerning a film made of a blend of polyphenyleneoxide and polystyrene in Comparative Example 1 of JP '094, the film must exhibit a negative birefringence to have the reverse retardation distribution (see the requirement (3) of claim 5 of the present application).

However, the film of Comparative Example 1 of JP '094 has a retardation of 24nm at a wavelength of 546nm, i.e., a negative birefringence, thus not satisfying the requirement (3) of claim 5 of the present application. Therefore, the film of Comparative Example 1 of JP '410 does not exhibit the reverse retardation distribution.

Concerning a film comprising a liquid crystal and a blend polymer similar to that of Comparative Example 1 as described in Example 1 of JP '094, the weight ratio of polyphenyleneoxide to polystyrene is 64 to 26 corresponding to 71wt% and 29wt% of the polyphenyleneoxide and polystyrene, which is the same as those of the blend polymer in Comparative Example 1. The conditions for preparing the film is almost the same as those in Comparative Example 1. Therefore, the film of Example 1 is considered to have the same birefringence and therefore almost the same level retardation as the film of Comparative Example 1.

Since JP '094 describes that a polymer having a positive inherent birefringence and a polymer having a negative inherent birefringence can be mixed in order to make the inherent birefringence small, the birefringence of the polymer matrix of the film of Example 1 is considered to be small.

On the other hand, the birefringence of the film of Comparative Example 1 is 0.000429=24nm(retardation)/56 μm(thickness) and the birefringence of the film of Example 1 is

0.00175=495nm(retardation)/66 μm(thickness). The greater birefringence of the film of Example

1 is a result of mixing a liquid crystal and therefore the birefringence of the added liquid crystal

must be positive.

Therefore, the film of Example 1 is made of components having a positive birefringence.

In this case, the film cannot exhibit the reverse retardation distribution (the requirement of claim

4 or 5 of the present invention). Thus, JP '094 does not teach the present invention.

4.   JP-A-10-68816

JP '816 discloses a retardation film comprising a laminate of a ¼ λ plate and a ½ λ plate,

which is essentially different from a single film of a retardation film exhibiting the reverse

retardation distribution of the present invention.

5.   JP-A-09-189811

JP '811 discloses a polarizer comprising a polarizing filtering film and a ¼ λ plate, which

is essentially different from a single film of a retardation film exhibiting the reverse retardation

distribution of the present invention.

That is, the retardation film is first characterized by the feature that it is a single oriented

film, not a laminate film of two or more films, and this single film satisfies the retardation

distribution (formulae (1) and/or (2)) and the water absorption factor.

Although the Examiner is of the opinion that since the present invention is defined as the

open claim using the term "comprising", the essential difference between the retardation film of

the present invention and those of the cited references reside in the feature that it is a single

oriented film, not a laminate film of two or more films, and this single film satisfies the

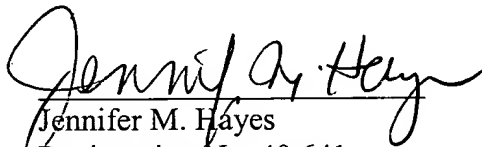15

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retardation distribution (formulae (1) and/or (2)) and the water absorption factor. Therefore, even if the claims use the term "comprising", the present invention is definitely distinguished from the cited references.

IV.   Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

The claims are amended as follows:

1.   (Amended)   A retardation film, [comprised of] <u>characterized in that said</u>

<u>retardation film is</u> a single oriented film, [characterized in that] the retardation at wavelengths of

450 nm and 550 nm of said retardation film satisfies the following formulae (1) and/or (2), and

the water absorption of said retardation film is no greater than 1%:

R(450)/R(550) < 1   (1)

K(450)/K(550) < 1   (2)

where R(450) and R(550) represent the in-plane retardation of the oriented polymer film at

wavelengths of 450 nm and 550 nm, respectively, and 450 nm and 550 nm, respectively, and

K(450) and K(550) are the values calculated by $K=[n_x + n_y)/2]$ x d (where n_x, n_y and n_z represent

the three-dimensional refractive indexes of the oriented polymer film as the refractive indexes in

the direction of the x-axis, y-axis and z-axis, respectively, and d represents the thickness of the

film) for the oriented polymer film at a wavelength of 450 nm an 550 nm, respectively.